Dehcho Boreal Caribou Study Progress Report, April 2007

By N.C. Larter & D.G. Allaire
Environment and Natural Resources, Fort Simpson

Background

In response to the new federal Species at Risk Act (SARA) and following extensive consultation with the Sambaa K'e Dene Band (SKDB) of Trout Lake, the Department of Environment and Natural Resources (ENR), Dehcho Region initiated an ecological study of boreal caribou in the Trout Lake area during the spring of 2004. SKDB saw the benefits of combining information from this study with their own traditional knowledge study (Yúndíit'qh TEK study) to fill knowledge gaps about boreal caribou. An initial ten female boreal caribou were collared in the Celibeta Lake area in order to document seasonal range use and movements, calving period/locations, and fidelity of seasonal range use and movements over a 4-5 year period. Collared females would also provide information on calf production, calf survival, and adult female survival. Other ecological studies of boreal caribou had been initiated in other regions of the Northwest Territories to increase knowledge of boreal caribou throughout their range so that in the face of increasing development pressures informed decisions regarding land use could be made.

Because snow conditions restricted caribou distribution in 2004, at the request of SKDB an additional 8 satellite collars were deployed on female boreal caribou in spring 2005. Subsequently, SKDB requested an additional 4 collars be deployed on female boreal caribou in their study area in January 2006. Previous annual progress reports of the Trout Lake Caribou Study have been published (Larter and Allaire 2005; 2006a) and provide more detailed information. Results have been used in support of the Sambaa K'e Candidate Protected Area.

In response to the requests and after extensive consultations with the Fort Simpson Métis Local (FSML) and Liidlii Kue First Nations (LKFN), ENR Dehcho Region initiated an ecological study of boreal caribou in the Ebbutt Hills area in spring 2005 when 5 satellite collars were deployed on female boreal caribou. The study area included portions of the proposed Mackenzie Gas Pipeline; study objectives were similar to the Trout Lake study. Subsequently, at the requests of Jean Marie River First Nation (JMRFN), Pehdzeh Ki First Nation (PKFN) in Wrigley, and Nahanni Butte Dene Band (NBDB) the Ebbutt Hills study area was expanded and an additional 9 collars (5 satellite and 4 VHF) were deployed in the study are in January 2006. A previous progress report of the Ebbutt Hills Study has been published (Larter and Allaire 2006b) which provides more detailed information.

Boreal caribou do not respect study area boundaries and collars have been deployed on female boreal caribou throughout the Dehcho Region with continued support of local First Nations. At the 3rd biannual Dehcho Regional Wildlife Workshop in Fort Simpson (October 2006) it was decided to treat all the boreal caribou work as one larger study. This progress report combines the background information and updates the results of the previous Trout Lake and Ebbutt Hills boreal caribou studies.

Collar Descriptions

Satellite collars (Telonics ST-20, preferred teardrop design) have been deployed annually (Fig. 1). All satellite collars have a very high frequency (VHF) beacon so they can be relocated from the ground or air with a receiver and antenna system. Collars are programmed to provide daily locations from 1 May to 14 June (the anticipated calving period) and locations once every 3 days for the remainder of the year with a life span of 3-4 years. All satellite collars deployed after March 2004 are equipped with release mechanisms to release in March 2009 or March 2010.

GPS collars (Telonics TGW-3680, standard design) were deployed in January 2007 (Fig. 2). All GPS collars have a very high frequency (VHF) beacon so they can be relocated from the ground or air with a receiver and antenna system. GPS collars provide 3 locations daily, for approximately 40 months, thus providing much more detailed information on movements and range use. GPS collars are equipped with a release mechanism programmed to release in June 2010.

VHF collars (Telonics MOD600, preferred teardrop design) were deployed in January 2006. They look similar to ST-20 collars except they have no satellite beacon. We must fly to locate these collars with a receiver and antenna system. They are equipped with a sensor indicating the collar has not moved (presumed dead caribou). These collars provide limited information on range use but provide information on adult and calf survival and calf production. These collars are programmed to release in 2011.

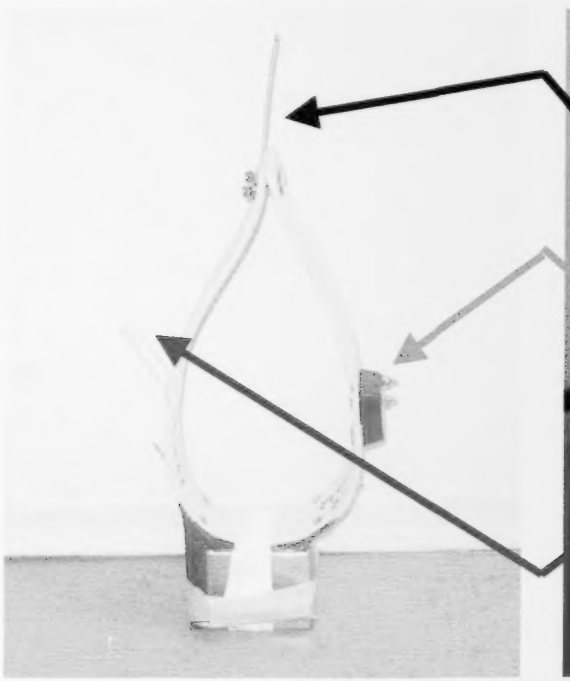

Figure 1. Telonics ST-20 satellite collar teardrop design with release mechanism (red arrow), satellite beacon (blue arrow) and VHF beacon (**black** arrow).

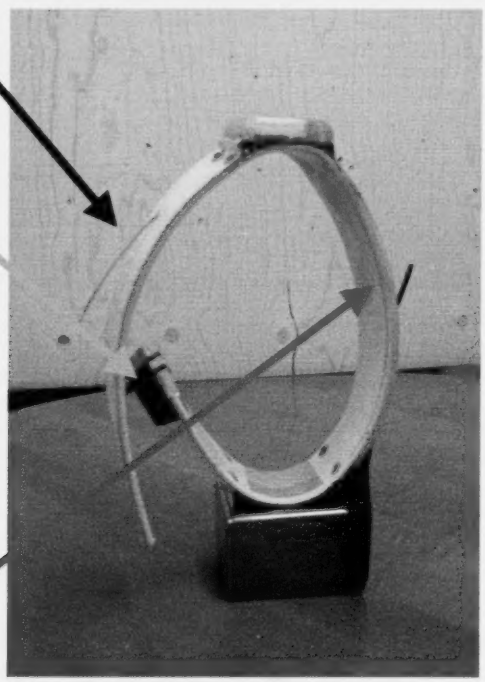

Figure 2. Telonics TGW-3680 GPS collar standard design with release mechanism (red arrow), satellite beacon (blue arrow), VHF beacon (**black** arrow) and a GPS antenna (top of collar).

Collar Deployment

All caribou have been captured by net-gunning the animal from a helicopter. Because of the extreme danger of this work and to minimize animal harassment, ENR has contracts a professional crew of net-gunner, animal handler, and helicopter pilot to do the work. Collaring is only conducted under appropriate snow conditions and the crew follows strict animal care guidelines. Blood, an ear plug, and feces are collected from each captured animal as long as the opportunity arises. Handlers wear rubber gloves and handling times are kept to a minimum. For the initial collaring in the 2 different study areas ENR conducted reconnaissance flights in a fixed-wing aircraft prior to the capture operation so the capture crew could be directed to areas where caribou were present. Local observers and ENR staff participated in these flights. Since 2006, aerial reconnaissance flights prior to capture operations have been discontinued at the request of First Nations in order to minimize animal harassment. Capture crews are now directed to areas requested by First Nations where collared caribou are residing. From March 2004 to January 2006 collars were deployed on a total of 36 boreal caribou throughout the study area (Fig. 3). Ten satellite collars were deployed in March 2004, 13 satellite collars were deployed in March 2005, and 9 satellite and 4 VHF collars were deployed in January 2006. No animal has been injured during captures.

Program Highlights and Updates

In April 2006, ENR made a poster presentation of the Dehcho boreal caribou program at the 11th North American Caribou Workshop in Jasper. Our results indicated differences in boreal caribou ecology from our relatively pristine boreal forest environment versus southern Canada's highly developed and fragmented boreal forest environment.

During 2006 there were continued requests at community meetings from SKDB, FSML, JMRFN, PKFN and NBDB for an increased number of collars to be deployed throughout the study area. There was particular interest in deploying GPS collars in order to get more detailed information on range use and movements in and around the location of the Enbridge Pipeline and the proposed routing of the Mackenzie Gas Pipeline. At the 3rd biannual Dehcho Regional Wildlife Workshop in October an action item was tabled that requested ENR deploy a minimum of 5 GPS collars and all available refurbished satellite collars on female boreal caribou throughout the Dehcho in January 2007. ENR acquired enough funds to purchase and deploy 9 GPS collars, and to refurbish and deploy 8 satellite collars in January 2007. Animals were collared throughout the Dehcho (Fig. 4) in areas requested by SKDB, FSML, JMRFN, PKFN, and Acho Dene Koe Band (ADKB - Fort Liard). LKFN decided not to support the program immediately prior to the collar deployment so no collars were deployed on boreal caribou located to the south of the Mackenzie and west of the Liard Rivers. Collars were deployed by a professional crew 21-24 January. One GPS collar had to be repaired and was deployed on 24 February.

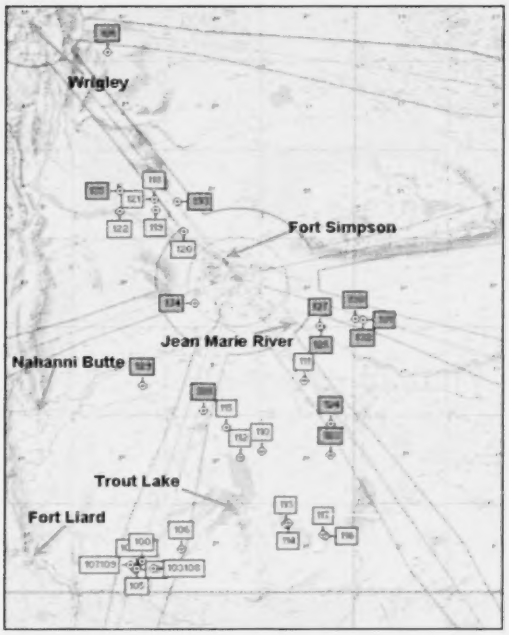

Figure 3. The locations of 36 female boreal caribou collared in , , 2006 (see colour for locations).

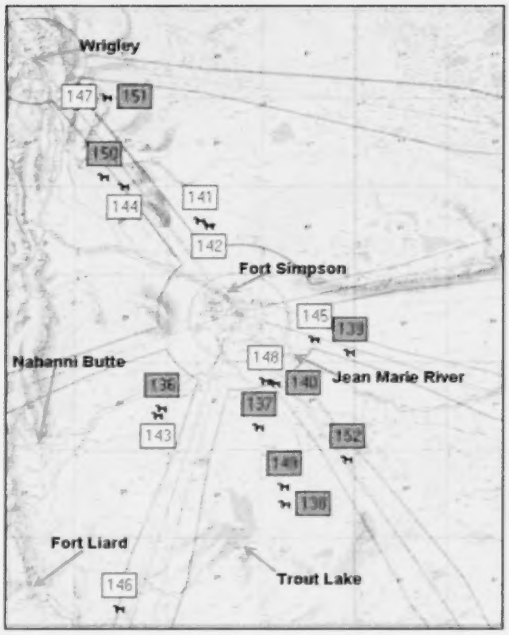

Figure 4. The locations of 17 female boreal caribou collared in 2007; red numbers indicate GPS collars and yellow indicates refurbished satellite collars.

There were continued discussions at the 3rd biannual Dehcho Regional Wildlife Workshop about the best way to share and provide satellite location information to all partners in the boreal caribou program. There was concern that even maps with a 2-week delay in locations would make caribou more vulnerable to hunters. After considerable discussions with all First Nations involved in the program it was decided that ENR would produce a map every 3 months that showed the area where each collared animal had been over that past 3 months. These maps would be provided to each First Nation involved in the program and a copy would be kept at ENR Fort Simpson. The first map will be coming out in April 2007.

Relocation Flights – primarily for VHF collared animals

This year we attempted to locate the 4 animals (#132-135) equipped with VHF collars at least once a month. Although the collars had been deployed on animals in the vicinity of Fort Simpson and Jean Marie River these animals ranged over large areas and were elusive. We did not locate each animal every month nor on every flight. Flights were primarily flown with a fixed-wing aircraft generally at a high elevation because a visual observation is not necessary. We used a Cessna 172 or 185 depending upon weather conditions, aircraft availability, and cost. We made opportunistic relocation flights associated with fire mapping and the fall ENR moose survey. Additional flights were made when there was an indication that collared animals were stationary for an extended period of time or we suspected collars had

malfunctioned. From 1 March 2006 to 31 March 2007 we attempted 20 flights primarily to locate caribou with VHF collars; 2 flights were aborted before any animals could be relocated due to deteriorating weather conditions. A brief account of each flight can be found in Appendix 1.

Relocation Flights – All collared animals

As part of the program we plan on relocating all collared animals three times during the year. Photographs of caribou observed are also taken to verify the presence of calves.

1. During post-calving in late May-early June to determine if collared females have calves of the year with them as a measure of calf production. This flight requires the use of a helicopter.
2. During fall (late-September) again to determine if collared females have calves of the year with them going into the winter. This flight is usually conducted with a fixed-wing aircraft.
3. During late February-early March to classify into different sex and age groups all caribou associated with collared animals and observed in transit. This provides a measure of calf survival over the winter and the number of calves, males, and females in a sample of the population. This flight requires the use of a helicopter.

We successfully flew the post-calving survey on 29-30 May locating all 21 females with fully functioning collars. We had visuals of 20 of the 21 females; 11 were accompanied by calves and 9 did not have calves with them. Due to problems with weather and aircraft availability we were unable to do a complete fall survey of all collared animals. Deborah Johnson (South Slave Biologist) relocated 13 animals south of the Mackenzie River on 16 September and we relocated an additional 3 collared animals north of the Mackenzie River on 28 September. We successfully completed sex/age classification surveys 1-2 March, 2006 and 26-27 February, 2007 classifying 170 caribou and 216 caribou respectively.

Collar Retrievals

Since spring 2006 we retrieved collars from 9 caribou that had died. All of these collars were sent to the manufacturers to be refurbished and all but one of these collars has been redeployed. The collar we retrieved in February 2007 is currently being refurbished. We continue to be successful at retrieving all collars from animals that have died during the study. More flight details can be found in Appendix 1.

Classification Survey Results

Since the previous 2 progress reports (Larter and Allaire 2006a; b) we completed 2 very successful classification surveys, 1-2 March, 2006 26-27 February, 2007. For

both surveys we were successful in relocating and observing all caribou with properly functioning VHF beacons, and in locating other groups of caribou not associated with collared animals. Caribou were widely distributed throughout the Dehcho; we flew for almost 1200km in 2006 and 1600km in 2007. In 2006 we relocated 24 collared animals (20 with satellite and 4 with VHF collars); 2 other caribou had VHF beacons which were not functioning. In 2007 we relocated 33 collared animals (20 satellite, 4 VHF, and 9 GPS collars); 2 other caribou had VHF beacons which were not functioning. We classified animals into calves (8-10 months old), yearlings (20-22 months old), females ($\geq$32 months old), and males ($\geq$32 months old). We recorded observations of all other wildlife seen during the survey. Table 1 summarizes the results of the 2 surveys.

	2006	2007
Total number caribou observed	170	216
Number of female caribou	94	114
Number of calf caribou (8-10 months old)	27	26
Number of yearling caribou (20-22 months old)	13	6
Number of male caribou	35	70
Number unknown sex/age class caribou	1	0
Number of calves per 100 female caribou	28.7	22.8
Number of moose observed	18	38
Number of wolves observed	2	1

Table 1. The number of caribou classified and other wildlife observed during caribou sex/age classification surveys in 2006 and 2007.

Of the 11 collared female caribou that we know had calves in May 2005, 8 (72.7%) were observed with calves in the March 2006 sex/age classification survey. Of the 13 collared female caribou that we know had calves in May 2006, 6 (46.2%) were observed with calves in the February 2007 sex/age classification survey. The number of calves per 100 adult females that we report in February/March is slightly higher than that 12-22 reported for caribou in the adjacent Cameron Hills study area (D. Johnson unpubl. data), but much lower than the 50-66 reported for caribou in the northern range of the Lower Mackenzie Valley study area near Tsiigehtchic (J. Nagy unpubl. data). Wolf predation on boreal caribou in the Lower Mackenzie Valley is negligible unlike in the Cameron Hills and Dehcho study areas (J. Nagy and D. Johnson pers. comm.).

Mortalities

A number of collared caribou have died since we initiated this study in March/April 2004: 8 of the original 10 animals captured in March/April 2004, 5 of the 13 animals captured in March 2005, and 5 of the 13 animals captured in January 2006. The current best estimate of mean adult female adult survival is 76%. This is similar to that reported for the Cameron Hills study area (D. Johnson pers. comm.), but less than

the 86.7% reported for the Lower Mackenzie study area (Nagy et al. 2005). There is strong evidence to suggest that 16 of the 18 mortalities were caused by wolf predation. The remaining animals (# 104 and 130) likely died of age related causes. Their carcasses were found relatively intact. Fifteen of the 18 mortalities occurred between late-March and mid-July. The majority of female mortalities in the Cameron Hills study area have also occurred during a similar time period (D. Johnson pers. comm.). The other mortalities occurred in September (1) and November (2).

Teeth have been retrieved from 8 of the 18 mortalities. Ages were determined at Matson's Laboratory and are based upon counting cementum annuli on teeth, similar to counting the rings of a tree. 1 June is used as the birth date for caribou (Matson 1981). The youngest animal (#103) died at age 5 years 11 months. The remaining animals died at age 10 years 9 months (#121), 11 years 11 months (#104), 14 years 11 months (#101), 15 years 1 month (#118), and 17 years 1 month (#110). We are waiting for the ages of teeth from #105 and #130. The old ages were surprising, especially since blood tests from these animals showed that females were pregnant at 10, 13, and 16 years of age.

Although in our study area the boreal forest is relatively pristine, the Dehcho Land Use Plan (DLUP) indicates a noticeable linear footprint on the landscape. Based upon the DLUP digital linear footprint files we calculated the distance of caribou mortalities from the nearest linear feature. Of the sixteen predator related mortalities 2 occurred $<$100m from a linear feature, 4 occurred 150-351m from a linear feature, 3 occurred 500-750m from a linear feature and 7 occurred 1.0-3.5km from a linear feature. Two of the mortalities that occurred 1.0-3.5km from a linear disturbance were located $<$100m from well-established animal trails. The 2 animals whose death was not related to predation died 150 and 200m from the nearest linear feature.

Annual Home Ranges, Movements and Group Size

We have been able to calculate annual home ranges for 21 collared animals. This means we have locations for a caribou for at least 1 entire year. We calculate the range by drawing a line that joins all of the outside points where a caribou was located over a year. This is called a 100% Minimum Convex Polygon estimate. Annual home range size for these animals ranged from 441-5087km^2. The average home range size was 1686km^2. Seven animals have ranged into northeastern British Columbia (see Fig. 5). Home range sizes we report are similar to those from a Cameron Hills study (D. Johnson pers. comm.) but somewhat smaller than those reported for the Lower Mackenzie Valley study area (Nagy et al. 2005).

Similar to what has been reported previously (Larter and Allaire 2006a; b) and elsewhere (Nagy et al. 2005; D. Johnson pers. comm.) female boreal caribou are widely dispersed, found in small groups (1 or 2 adult females), and have limited movements during the calving/post-calving period and throughout the summer. Movements increase and group size increases during the fall/rut (1 September – 15 October) as females and males are found together. During winter (16 October – 30

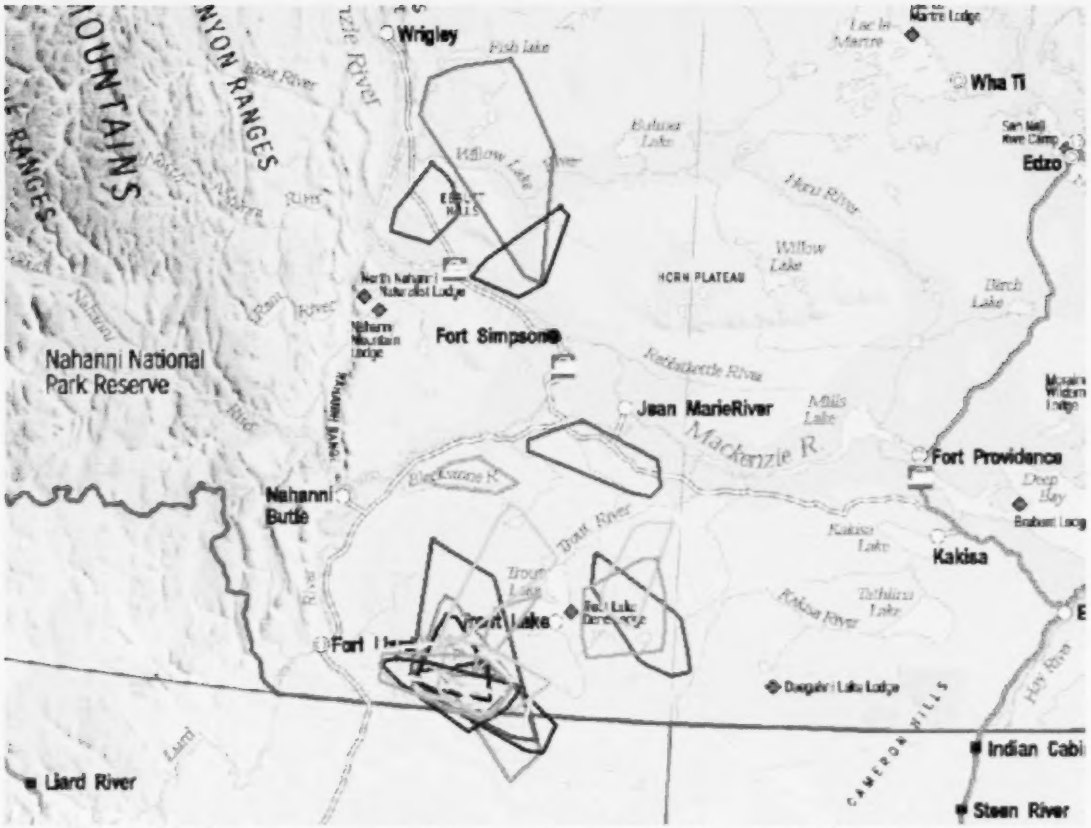

Figure 5. Minimum convex polygon estimates of the annual home ranges of 21 collared female boreal caribou.

April) we find the largest group sizes but caribou are still found in small groups (3-5 animals). The greatest directional movements occur during early (November) and late (April) winter. With the recently deployed GPS collars we are collecting much more detailed information on daily movement and distances traveled.

Calving Fidelity

Our preliminary findings (Larter and Allaire 2006a; b), and those from the South Slave (D. Johnson pers. comm.) indicated a greater amount of fidelity to calving areas than found for caribou in the Lower Mackenzie Valley study area (J. Nagy pers. comm.). However this was based upon only 5 females over 2 years. We now have estimated calving locations of 3 females for 3 years and 13 females for 2 years. Two of the 3 females (with 3 estimated calving locations) calved <6.5km apart (straight line distance) between successive years. The third female in 2005 calved <10km from where she calved in 2006, but almost 40km away from where she calved in 2004. Seven of the 13 females (with only 2 estimated calving locations) calved <10km apart (straight line distance) in successive years. The remaining 6 females calved an average of 36.4km apart (range 20.1-58.6km). Some females certainly show more calving fidelity than others.

With the deployment of 9 GPS collars on female caribou and the completion of the earth cover classification project by Ducks Unimited we should be able to look at resource selection of boreal caribou in the study area at much finer detail. With the recent burns (summer 2004) to the east of Trout Lake and the continued delay in the Mackenzie Gas Project the increased frequency of locating collared caribou will provide very pertinent and timely information on boreal caribou ecology.

We realize that with the higher number of mortalities than anticipated in this study area there is a need to redeploy retrieved and deploy additional collars in order to maintain an adequate number of collared caribou. Eight satellite collars and 9 GPS collars were deployed January-February 2007 in locations requested by First Nations supporting this program. We will continue to retrieve collars from animals that die for redeployment in areas requested.

Two of the collars deployed in March/April 2004 continue with inconsistent satellite transmissions during part of the winter. We have been working with the manufacturing company to try and determine the cause(s) and rectify the situation without success. The manufacture has modified our refurbished collars at their expense and has offered to refurbish the malfunctioning units at no charge if we can retrieve them.

References

Larter NC, Allaire DG. 2005. Trout Lake boreal caribou study progress report, February 2005. ENR Fort Simpson.

Larter NC, Allaire DG. 2006a. Trout Lake boreal caribou study progress report, February 2006. ENR Fort Simpson.

Larter NC, Allaire DG. 2006b. Ebibutt Hills boreal caribou study progress report, February 2006. ENR Fort Simpson.

Matson, GM. 1981. Workbook for cementum analysis. Milltown, MT.

Nagy JA, Aurait A, Wright W, Slack T, Ellsworth I, Kienzler M. 2005. Ecology of boreal woodland caribou in the Lower Mackenzie Valley, NT: April 2003-November 2004.

Personal Communications

Deborah Johnson, Regional Biologist, South Slave Region, ENR
John Nagy, Senior Wildlife Researcher,. Mackenzie Valley Development, ENR

Appendix 1. Brief descriptions of relocation and collar retrieval flights conducted since March 2006.

All relocation flights.

- On 1-2 March, 2006, we used a helicopter to relocate 24 animals with active collars and conduct a sex/age classification survey.
- On 13 April we relocated #115, 132 and 134 on a fixed-wing flight to a community meeting in Trout Lake.
- On 18 April we used a fixed-winged aircraft to relocate #120, 133 and 135.
- On 4 May we used a fixed-winged aircraft to relocated #132, 133, 134 and 135.
- On 29-30 May we used a helicopter to relocate and get visual observations of 20 of 21 caribou with functioning collars. We also made visual observations of collars by the remains of caribou #117 and 124.
- On 22 June we used a fixed-winged aircraft to relocate #132, 133, 134 and 135.
- On 13 July we used a fixed-winged aircraft to relocate #133, 134 and 135.
- On 28 July we used a fixed-wing aircraft to check on #130, which had been stationary; we were unable to see any caribou in the vicinity. We located #125, 127 and 131 during the flight.
- On 5 August we used a forestry helicopter to relocate #120 which was near a high priority fire.
- On 6 August we used a forestry helicopter to relocate #120 which was near a high priority fire.
- On 15 August we used a fixed-winged aircraft to relocate #125, 133, 134 and 135.
- On 16 September Deborah Johnson (South Slave Regional Biologist) used a fixed-wing aircraft to relocate 13 collared animals south of the Mackenzie River, including #132 which had not been located since 22 June. She had been flying this area because one of the animals she collared SW of the Cameron Hills had moved into the Trainor Lake area.
- On 28 September we used a fixed-wing aircraft to relocate #125, 132 and 135.
- On 14 November deteriorating weather forced our return to Fort Simpson before we could relocate any collars.
- On 24 November we relocated #132 and 134 on a fixed-wing flight returning from a moose survey along the Liard River valley.
- On 20 January 2007, we used a fixed-wing aircraft to relocate #132, 134 and 135.
- On 5 February we used a fixed-wing aircraft to check on a GPS collar #152 and relocated #132 en route.
- On 22 February we used a fixed-winged aircraft to relocate #132, 133, 134 and 135. This was the first time we were able to relocate 133 since 15 August, 2006.
- On 26-27 February we used a helicopter to relocate 33 animals with active collars and conduct a sex/age classification survey.

- On 9 March we used a fixed-wing aircraft to relocate #132, 134.
- On 13 March deteriorating weather forced our return to Fort Simpson before we could relocate any collars.
- On 15 March we used a fixed-wing aircraft to relocate #133, 135.
- On 22 March we used a fixed-wing aircraft to relocate #133, 135; aircraft problems forced us to return to Fort Simpson before relocating the other 2 VHF collars.
- On 23 March we used a fixed-wing aircraft to relocate #132, 134.

All flights to retrieve collars from dead animals.

- On 30 May 2006, during the post-calving survey, we used a helicopter to retrieve the collar from #106.
- On 23 August we used some forestry helicopter time to retrieve collars from #105, 109, 117, 124 and 130. Evidence at the sites indicated that all except #130 had likely been killed by wolves; the carcass of #130 was virtually intact. We found teeth from #'s 105 and 130.
- On 23 October we used a helicopter to retrieve collars from #125 and 127; both had been were stationary for a few weeks and appeared to have been killed by wolves. We found teeth from #127, and the carcass of her calf.
- On 27 February 2007, during the sex/age classification survey, we used a helicopter to retrieve the collar from #123.

Appendix 2. A time line of each collared caribou since 2004.

Animal # 100

- 29 March/04 collared
- 29 May/04 seen in group of 3 (no calf)
- 3 June/04 seen alone (no calf)
- 22 Sept/04 no visual
- 25 Jan/05 seen in group of 11, no calf
- 31 May/05 seen in group of 3 with calf
- 19 June/05 seen alone (no calf)
- 23 Sept/05 a problem with VHF reception
- 30 Oct/06 a problem with satellite signal reception
- 6 Feb/06 no satellite/VHF signal

Animal # 101

- 30 March/04 collared
- Died during month of May/04, likely wolf predation
- 9 August/04 collar retrieved

Animal #102

- 29 March/04 collared
- Died 14-15 May/04, wolf predation
- 3 June/04 collar retrieved

Animal #103

- 1 April/04 collared
- 29 May/04 seen in group of 3 with calf
- 3 June/04 not checked on
- 22 Sept/04 no visual
- 25 Jan/05 not checked on
- Died 25-30 April/05, likely wolf predation
- 4 May/05 collar retrieved

Animal #104

- 29 March/04 collared
- 29 May/04 seen in group of 3 (no calf)
- 3 June/04 seen in group of 3 (no calf)
- 22 Sept/04 no visual
- 25 Jan/05 not checked on
- Died 19-27 April/05, death probably related to old age
- 4 May/05 collar retrieved

Animal #105

- 30 March/04 collared
- 29 May seen in group of 3 with calf
- 3 June/04 not checked on
- 22 Sept/04 no visual
- 25 Jan/05 seen in group of 3 (no calf)
- 31 May/05 seen alone (no calf)
- 19 June/05 seen alone (no calf)
- 23 Sept/05 no visual
- 2 March/06 seen in group of 11 no calf
- 23 Aug/06 collar retrieved

Animal #106

- 30 March/04 collared
- 29 May/04 no visual
- 3 June/04 seen in group of 2 with calf
- 22 Sept/04 seen in group of 7 (no calf)
- 25 Jan/05 seen in group of 5 (no calf)
- 31 May/05 seen alone (no calf)
- 23 Sept/05 seen in group of 2 (no calf)

Animal #106 (cont.)

- Died 21-24 Nov/05, likely wolf predation
- 30 May/06 collar retrieved

Animal #107

- 1 April/04 collared
- 29 May/04 no visual
- 3 June/04 not checked
- 22 Sept/04 seen in group of 3 with calf
- 25 Jan/05 not checked
- Died 14-17 April/05 likely wolf predation
- 4 May/05 collar retrieved

Animal #108

- 1 April/04 collared
- 29 May/04 seen alone (no calf)
- 3 June/04 no visual
- 22 Sept/04 seen in group of 3 (no calf)
- 25 Jan/05 seen in group of 4 (no calf)
- 31 May/05 no visual
- 10 June/05 no visual
- 19 June/05 seen with calf
- 23 Sept/05 no visual
- 5 Oct/05 seen in group of 5 with calf
- 2 Mar/06 seen in group of 3 with yearling
- 30 May/06 seen with calf
- 23 Jan/06 seen in group of 5 with calf
- 27 Feb/07 seen in group of 11with calf

Animal #109

- 1 April/04 collared
- 29 May/04 no visual
- 3 June/04 not checked on
- 22 September/04 seen in group of 4 (no calf)

Animal #109 (cont.)

- 25 Jan/05 not checked on
- 31 May/05 seen with calf
- 19 June/05 seen with calf
- 23 Sept/05 no visual
- 5 Oct/05 seen in group of 3 with calf
- Died 22-25 April/06, likely wolf predation
- 23 Aug/06 collar retrieved

Animal #110

- 5 March/05 collared
- 10 April/05 not checked on
- 5 May/05 seen alone (no calf)
- 31 May/05 seen alone (no calf)
- 10 June/05 not checked on
- Died 5-11 June/05 likely wolf predation
- 29 July/05 collar retrieved

Animal #111

- 3 March/05 collared
- 10 April/05 not checked on
- 5 May/05 seen in group of 2
- 31 May/05 seen with calf
- 10 June/05 not checked on
- 23 Sept/05 seen in group of 5 with calf
- 5 Oct/05 not checked on
- 1 March/06 seen in group of 9 no calf
- 29 May/06 seen with calf
- 16 Sep/06 seen in group of 3
- 24 Jan/07 seen in group of 14
- 27 Feb/07 seen in group of 4 with calf

Animal #112

- 3 March/05 collared
- 10 April/05 seen with calf
- 5 May/05 not checked on
- 31 May/05 seen with calf
- 10 June/05 seen with calf

Animal #112 (cont.)

- 23 Sept/05 no visual
- 5 Oct/05 not checked on
- 1 Mar/06 seen in group of 6 with calf
- 30 May/06 seen in group of 4 with calf
- 16 Sep/06 seen with calf
- 27 Feb/07 seen in group of 5 with calf

Animal #113

- 3 March/05 collared
- 10 April/05 seen in group of 4
- 5 May/05 not checked on
- 31 May/05 no visual
- 10 June/05 seen alone (no calf)
- Died 2-8 Sept/05 likely wolf predation
- 5 Oct/05 collar retrieved

Animal #114

- 3 March/05 collared
- 10 April/05 seen in group of 9
- 5 May/05 not checked on
- 31 May/05 no visual
- 10 June/05 seen alone (no calf)
- 23 Sept/05 no visual
- 5 Oct/05 not checked on
- 2 March/06 seen in group of 6 no calf
- 29 May/06 seen in group of 3 no calf
- 16 Sep/06 seen in group of 3 no calf
- 27 Feb/06 seen in group of 6 no calf

Animal #115

- 3 March/05 collared
- 10 Apr/05 seen in group of 3

Animal #115 (cont.)

- 5 May/05 not checked on
- 31 May/05 seen alone (no calf)
- 10 June/05 not checked on
- 23 Sept/05 no visual
- 5 Oct/05 seen in group of 2 no calf
- 2 March/06 seen in group of 9 no calf
- 30 May/06 seen in group of 2 no calf
- 16 Sep/06 seen in group of 4 no calf
- 27 Feb/07 seen in group of 4 no calf

Animal #116

- 3 March/05 collared
- 10 April/05 not checked on
- 5 May/05 not checked on
- 31 May/05 seen alone (no calf)
- 10 June/05 no visual
- 23 Sept/05 seen in group of 3
- 5 Oct/05 not checked on
- 26 Jan/06 seen in group of 7 with calf
- 2 March/06 seen in group of 4 with calf
- 29 May/06 seen with calf
- 16 Sept/06 seen in group of 2 no calf
- 23 Jan/07 seen in group of 12 no calf
- 27 Feb/07 seen in group of 6 no calf

Animal #117

- 3 March/05 collared
- 10 April/05 not checked on
- 5 May/05 not checked on
- 31 May/05 seen alone (no calf)
- 10 June/05 seen in thick brush

Animal #117 (cont.)

- 23 September/05 seen in group of at least 4
- 5 October/05 not checked on
- 26 Jan/06 seen in group of 4 with calf
- 2 Mar/06 seen in group of 5 with calf
- Died 17-21 April/06
- 28 Aug/06 collar retrieved

Animal # 118

- 4 March/05 collared
- 21 March/05 seen in group of 10
- 30 March/05 seen in group of 9
- 1 June/05 no visual
- 4 June/05 no visual
- Died 15-21 June/05, likely wolf predation
- 6 Sept/05 collar retrieved

Animal # 119

- 4 Mar/05 collared
- 21 Mar/05 seen in group of ≥ 8
- 30 Mar/05 no visual
- 1 June/05 seen alone (no calf)
- 23 Sep/05 no visual
- 10 Oct/05 no visual
- 16 Jan/06 in group of 5 no calf
- 1 Mar/06 in group of 4
- 30 May/06 with calf
- 22 Jan/07 in group of 3 with calf
- 26 Feb/07 in group of 11 with calf

Animal #120

- 4 March/05 collared
- 21 March/05 seen in group of 13

Animal #120 (cont.)

- 30 March/05 seen in group of 3
- 1 June/05 no visual
- 4 June/05 seen alone (no calf)
- 23 Sept/05 seen in group of 14
- 10 Oct/05 no visual
- 16 Jan/06 seen in group of 3
- 1 March/06 seen in group of 5
- 30 May/06 no calf
- 26 Feb/07 seen in group of 10 no calf

Animal #121

- 4 March/05 collared
- 21 March/05 seen in group of 3
- Died 26-27 March predated by wolves
- 30 March/05 collar retrieved

Animal # 122

- 4 March/05 collared
- 21 March/05 seen in group of 3
- 30 March/05 seen in group of 3
- 1 June/05 seen alone (no calf)
- 4 June/05 no visual
- 23 Sep/05 no visual
- 10 Oct/05 no visual
- 31 Nov/05 no satellite signal
- 4 April/05 got satellite signal back
- 30 May/05 seen no calf
- 24 Nov/06 no satellite signal

Animal #123

- 20 Jan/06 collared
- 2 March/06 seen in group of 4 with calf
- 29 May/06 no calf
- 16 Sept/06 seen in group of 3

Animal #123 (cont.)
- Died 1-5 Nov/06 on Trainor Lake
- 15 Feb/07 locate collar in ice
- 27 Feb/07 collar retrieved

Animal #124
- 20 Jan/06 collared
- 2 March/06 seen in group of 7 no calf
- Died 13-19 May/06, likely wolf predation
- 23 Aug/06 collar retrieved

Animal #125
- 22 Jan/06 collared
- 1 March/06 seen in group of 16 with yearling
- 29 May/06 seen with small calf
- Died 12-15 July/06, likely wolf predation
- 16 Sept/06 no visual
- 23 Oct/06 collar retrieved

Animal #126
- 21 Jan/06 collared
- 1 March/06 seen in group of 5 with yearling
- 30 May/06 seen with calf
- 26 Feb/06 seen in group of 13 no calf

Animal #127
- 22 Jan/06 collared
- 1 March/06 seen in group of 7 with calf
- 29 May/06 seen with calf
- Died 1-5 July/06, likely wolf predation
- 16 Sept/06 confirm carcass
- 23 Oct/06 collar retrieved

Animal #128
- 20 Jan/06 collared
- 2 March/06 seen in group of 5 no calf
- 30 May/06 seen in group of 4 with calf
- 16 Sept/06 seen in group of 3 no calf
- 27 Feb/07 seen in group of 5 no calf

Animal #129
- 20 Jan/06 collared
- 1 March/06 seen in group of 6 no calf
- 30 May/06 seen with calf
- 16 Sept/06 with calf
- 21 Jan/07 seen in group of 4 with calf
- 26 Feb/07 seen in group of 10 with calf

Animal #130
- 22 Jan/06 collared
- 1 March/06 seen in group of 7 no calf
- 29 May/06 no calf
- Died 1-7July/06
- 23 Aug/06 collar retrieved

Animal #131
- 22 Jan/06 collared
- 1 March/06 seen with calf
- 29 May/06 no calf
- 16 Sept/06 seen in group of 3 no cows
- 21 Jan/07 seen in group of 5 with calf
- 27 Feb/07 seen in group of 5 no calf

Animal #132
- 22 Jan/06 collared
- 1 March/06 seen in group of 9 with calf
- 29 May/06 approx. location not pregnant
- 16 Sept/06 seen in group of 2 no calf
- 26 Feb/07 seen in group of 3 no calf

Animal #133
- 21 Jan/06 collared
- 1 March/06 seen with calf
- 30 May/06 seen with calf
- 23 Jan/07 seen in group of 10 no calf
- 26 Feb/07 seen in group of 3 no calf

Animal #134
- 21 Jan/06 collared
- 1 March/06 seen in group of 3
- 29 May/06 seen with calf
- 16 Sept/06 seen in group of 4
- 26 Feb/07 seen in group of 2 no calf

Animal #135
- 21 Jan/06 collared
- 1 March/06 seen in group of 4 no calf
- 30 May/06 no calf
- 28 Sept/06 no visual
- 23 Feb/07 seen in group of 6 no calf

Animal #136
- 23 Jan/07 collared
- 26 Feb/07 seen in group of 5 no calf

Animal #137
- 23 Jan/07 collared
- 27 Feb/07 seen in group of 5 no calf

Animal #138
- 23 Jan/07 collared
- 27 Feb/07 seen in group of 4 no calf

Animal #139
- 21 Jan/07 collared
- 27 Feb/07 seen group of 6 no calf

Animal #140
- 24 Jan/07 collared
- 26 Feb/07 seen in group of 3 no calf

Animal #141
- 23 Jan/07 collared
- 26 Feb/07 seen in group of 2 no calf

Animal #142
- 22 Jan/07 collared
- 26 Feb/07 seen in group of 10 no calf

Animal #143
- 21 Jan/07 collared
- 26 Feb/07 seen in group of 6 no calf

Animal #144
- 23 Jan/07 collared
- 26 Feb/07 seen in group of 10 no calf

Animal #145
- 21 Jan/07 collared
- 27 Feb/07 seen in group of 3 no calf

Animal #146
- 21 Jan/07 collared
- 27 Feb/07 see in group of 11 with calf

Animal #147
- 22 Jan/07 collared
- 26 Feb/07 seen in group of 8 no calf

Animal #148
- 24 Jan/07 collared
- 26 Feb/07 seen in group of 12 no calf

Animal #149
- 24 Feb/07 collared
- 27 Feb/07 seen in group of 7 no calves

Animal #150
- 22 Jan/07 collared
- 26 Feb/07 seen in group of 2 no calf

Animal #151
- 22 Jan/07 collared
- 26 Feb/07 seen in group of 6 no calf

Animal #152
- 23 Jan/07 collared
- 27 Feb/07 seen in group of 6 no calf